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NATIONAL DAM SAFETY PROGRAM. BRUSH VALLEY DAM. NDI-PA-00652. PA--ETC(U)  
JUL 79

DACW31-79-C-0010

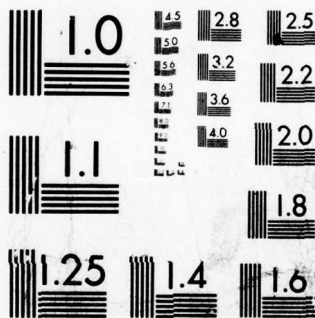
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NATIONAL BUREAU OF STANDARDS-1963-A

SUSQUEHANNA RIVER BASIN  
SOUTH BRANCH ROARING CREEK, COLUMBIA COUNTY

(P.S.)

PENNSYLVANIA

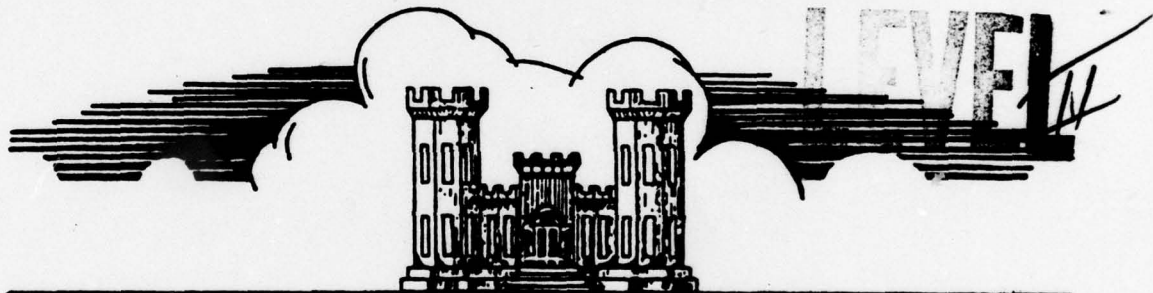
# BRUSH VALLEY DAM

NDI-PA 00652  
PA DER 19-3

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## PHASE I INSPECTION REPORT NATIONAL DAM INSPECTION PROGRAM



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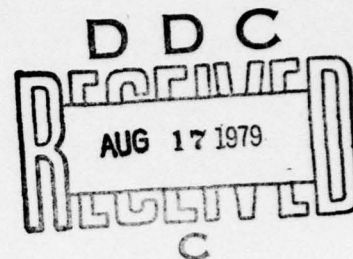
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FOR  
DEPARTMENT OF THE ARMY  
BALTIMORE DISTRICT CORPS OF ENGINEERS  
BALTIMORE, MARYLAND  
21203

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JULY 1979



DELAWARE RIVER BASIN

Name of Dam: Brush Valley Dam  
County & State: Columbia County, Pennsylvania  
Inventory Number: PA00652

11 Jul 79

6 PHASE I INSPECTION REPORT  
NATIONAL DAM SAFETY PROGRAM,  
Brush Valley Dam. NDI-PA-00652.  
PA DER-19-3. Susquehanna River Basin.  
South Branch Roaring Creek, Columbia  
County, Pennsylvania. Phase I Inspection  
Report.

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Prepared by:

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For

DEPARTMENT OF THE ARMY  
Baltimore District, Corps of Engineers  
Baltimore, Maryland 21203

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## PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I Investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. The test flood provides a measure of relative spillway capacity and serves as an aide in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

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PHASE I INSPECTION REPORT  
NATIONAL DAM INSPECTION PROGRAM

Name of Dam: Brush Valley Dam  
State Located: Pennsylvania  
County Located: Columbia  
Stream: Roaring Creek, South Branch  
Coordinates: Latitude 40° 50.2', Longitude 76° 21.9'  
Date of Inspection: April 10, 1979

ASSESSMENT

Brush Valley Dam is an earth embankment about 920 feet long and 21 feet high at its maximum section. It was originally constructed in the 1880's; modifications to the structure were made in 1923. The dam and impoundment are owned by the Roaring Creek Water Company. The water in the reservoir is used to supply a water distribution system.

Maximum storage capacity (Elevation 1128.0) is 328 acre-feet; the structural height of the dam is 21 feet. The dam is therefore classified as a "Small" size dam.

Examination of the results of the hydrologic and hydraulic analyses indicates that the spillway is able to pass approximately 25 percent of the Probable Maximum Flood (PMF) without the dam being overtopped. The Spillway Design Flood (SDF) for this "Significant" hazard structure is fifty percent of the PMF. Therefore, the spillway system is classified as "Inadequate".

Based on visual observations and review of the information obtained from the Pennsylvania Department of Environmental Resources, Brush Valley Dam appears to be in fair condition.

Recommendations and Remedial Measures are as follows:

a. Facilities

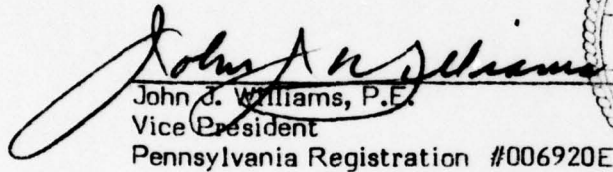
1. Further hydrologic and hydraulic studies should be made to determine the extent to which the spillway capacity should be increased.
2. A subsurface investigation program should be initiated to determine the composition and in situ properties of the earth embankment and foundation materials and to determine the stability of the dam. Piezometers should be placed to monitor the phreatic surface. The investigations should be supervised by a licensed professional engineer experienced in the design and construction of dams.
3. Provisions for placing an additional positive control valve on the 16-inch diversion pipe upstream of the embankment should be made. The valve operating mechanism should be fully accessible for all flow conditions.

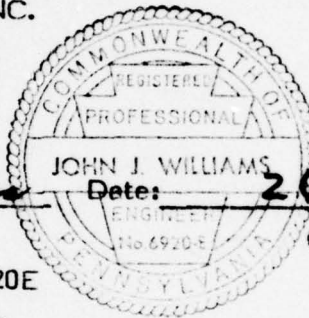
4. A ditch should be constructed to drain water away from the toe of the embankment.

b. Operation and Maintenance

1. The Owner should develop and implement a formal maintenance and inspection program to insure that all items are maintained on a regular basis. Maintenance activities performed should be recorded to provide a history of corrected deficiencies.
2. A downstream warning system should be developed by the Owner. During periods of heavy rainfall, the dam should be monitored and appropriate agencies should be alerted in the event of an impending failure.

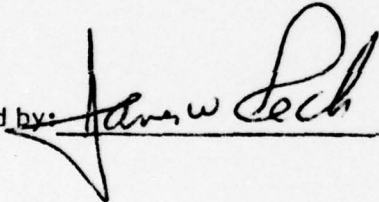
O'BRIEN & GERE ENGINEERS, INC.  
JUSTIN & COURTNEY DIVISION

  
John J. Williams, P.E.  
Vice President  
Pennsylvania Registration #006920E



Date: 26 July 1979

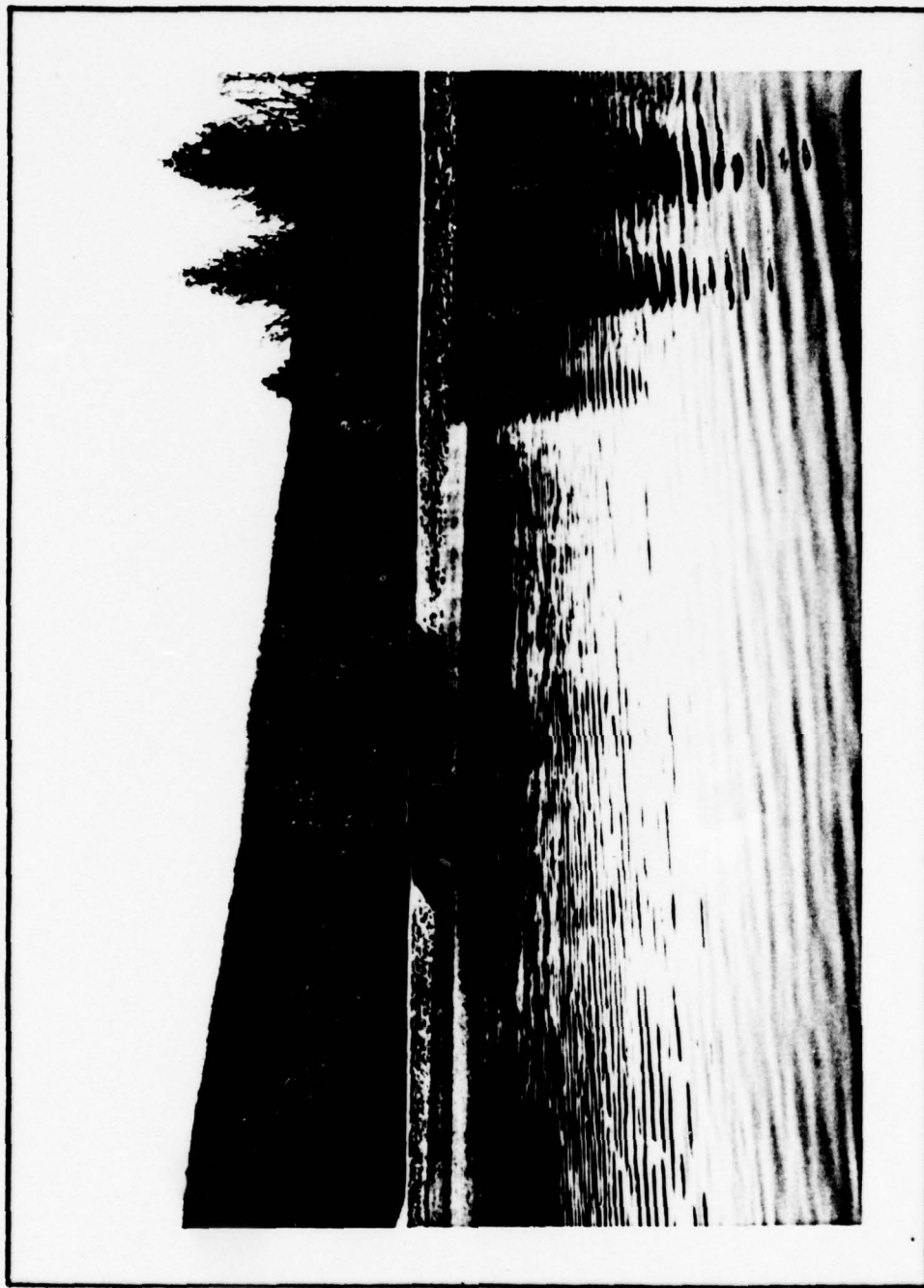
Approved by:



Date:

31 July 1979





*OVERVIEW  
BRUSH VALLEY DAM, COLUMBIA COUNTY, PENNSYLVANIA*

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PHASE I INSPECTION REPORT  
NATIONAL DAM INSPECTION PROGRAM  
BRUSH VALLEY DAM  
NATIONAL ID #PA00652

SECTION 1

PROJECT INFORMATION

1.1 General

a. Authority. The Dam Inspection Act, Public Law 92-367, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a program of inspection of dams throughout the United States.

b. Purpose. The purpose of this inspection is to determine if Brush Valley Dam constitutes a hazard to human life or property.

1.2 Description of Project (Supplemented by information obtained from the Pennsylvania Department of Environmental Resources (DER), Division of Dam Safety, Harrisburg, Pennsylvania.)

a. Dam and Appurtenances. Brush Valley Dam is an earth embankment with a maximum height of about 21 feet and an approximate length of 920 feet. The top of the dam (Elev. 1128.0) is 16 feet wide. The upstream slope is 2.5 horizontal to 1 vertical (2.5H:1V), and is protected with riprap. The downstream slope is 2 horizontal to 1 vertical (2H:1V) and is surfaced with grass.

An ungated overflow spillway is located about 200 feet from the right abutment. The crest of the spillway (Elev. 1123.0) is about 52 feet long. The control section is concrete, while the downstream slope is surfaced with riprap set in mortar. A timber decked steel beam bridge supported by 3 intermediate piers, provides access across the spillway.

A 16-inch diameter cast iron pipe is located at the base of the spillway section. The upstream end of the pipe is joined to a submerged intake structure. This structure is fitted with screens to prevent debris from entering the pipe. Pipe discharge is controlled by a valve located at the downstream end of the pipe in the center of the spillway channel. The valve is operated manually and diverts flow either to a pumphouse or to the downstream channel. Based on a review of the available drawings, no upstream control valve is positioned on the pipe.

The pumphouse is located at the toe of the embankment about 400 feet from the left abutment. Water is pumped from Brush Valley reservoir to a distributing reservoir about 8,000 feet to southeast. The distributing reservoir is about 600 feet above the level of Brush Valley reservoir.

b. Location. Brush Valley Dam is located on the south branch of Roaring Creek about 2.5 miles north of Centralia, in Columbia County, Pennsylvania. The dam site is located on the USGS Ashland Quadrangle (7½ min. series) at coordinates N 40° 50.2', W 76° 21.9'. A regional vicinity map, developed from the quadrangle sheet, is included as Plate 1, Appendix E.

c. Size Classification. The maximum height of the dam is about 21 feet and the reservoir storage to the top of the dam is approximately 328 acre-feet. Accordingly, the size of the dam is classified as "Small".

d. Hazard Classification. No population centers are located in the flood plain of the dam. Dwellings are limited to a few seasonally occupied homes located about three miles downstream and adjacent to the axis of another dam (Bear Gap Dam Number 6, NID #PA00817). Based on a comparison of the available flood storage capacity of Bear Gap Dam Number 6 (1,620 acre-feet) and the maximum storage capacity of Brush Valley Dam (328 acre-feet), complete failure of Brush Valley Dam and instantaneous release of the stored volume would appear to have a negligible hydraulic impact on Bear Gap Dam Number 6. Accordingly, the hazard potential is classified as "Significant" due to the potential loss of water supply.

e. Ownership. The dam is owned by the Roaring Creek Water Company. Correspondence should be addressed to the Roaring Creek Water Co., Shamokin, Pennsylvania, 17872.

f. Purpose of Dam. The dam is used by the Owner to store surface runoff for a water supply system.

g. Design and Construction History. No design or construction information relative to the construction of the original dam was available. A review of official state correspondence, however, indicates that the dam was initially built in the 1880's. An application for raising the dam 5 feet was submitted to the State in 1915 by the Locust Mountain Water Company. The applicant described the embankment material used in the initial construction as a "Clay containing a relatively large percentage of small stones evidently impervious to the passage of water". This was apparently a superficial observation as no record of borings is available. A review of the drawings included with the application indicates that the original embankment was composed of clay and sand. The original spillway was reported to be a rock-filled timber crib about 45 feet long, abutted by masonry walls 5 feet thick. The upstream slope approaching the spillway was constructed of clay.

A study of state correspondence indicates that no modifications to the dam were made until 1920. At that time, concrete cut-offs were extended about thirty feet into both embankments adjoining the spillway and a concrete cut-off was built in the downstream portion of the spillway. A 16-inch diameter cast iron pipe was placed through the base of the spillway section and the rock-fill was grouted. The spillway crest length was also increased to 53 feet.

A second application for raising the dam was submitted in 1922 and in 1923 the dam and spillway were raised 2 feet and 1-foot, respectively, to provide 13 million gallons additional storage. The downstream slope of the embankment was regraded to 2H:1V.



Additional remedial work was performed on the dam in 1932 and 1946 concentrating on repairs to the spillway section to reduce seepage and retard deterioration. According to the Owner's engineer the most recent repairs were made in 1975 and 1976. At that time, the spillway abutments were surfaced with a protective coating of gunite.

h. Normal Operating Procedures. There are no restraints to flow over the spillway. The control valve in the 16-inch diameter pipeline is normally positioned to divert flow to the pumphouse. About one million gallons is diverted to the water supply system daily. No daily releases are made for downstream low flow augmentation.

### 1.3 Pertinent Data

a. Drainage Area. The drainage area for Brush Valley Dam is 4.80 square miles, as taken from information provided by the DER and verified on topographic maps.

b. Discharge at Dam Site (CFS)

Maximum known flood at dam site, (June, 1972, Tropical Storm Agnes, WSE. 1125.6)	675
Maximum Spillway Capacity, WSE. 1128.0	1,800

c. Elevations - (Feet above MSL)

Top of Dam	1128.0
Spillway Crest (Normal Pool)	1123.0
Streambed at Dam	1107+
Pipe Invert (16-inch diameter, entrance)	Unknown

d. Reservoir Length (Feet)

Normal Pool, Elev. 1123.0	3,500
Maximum Pool, Elev. 1128.0	5,400

e. Reservoir Storage (Acre-Feet)

Normal Pool, Elev. 1123.0	126
Maximum Pool, Elev. 1128.0	328

f. Reservoir Surface (Acres)

Normal Pool, Elev. 1123.0	24 (design data)
	33 (planimetered)
Maximum Pool, Elev. 1128.0	79 (planimetered)

g. Dam Data

Type	Earth Embankment
Length	920 feet

Height	21 feet
Top Width	16 feet
Side Slopes	2.5H:1V upstream 2H:1V downstream
Zoning	No information available
Impervious Core	No information available
Foundation Treatment	No information available

h. Diversion System

16-inch diameter cast iron pipe controlled by a manually operated valve.

i. Spillway

Type	Concrete weir
Length	52 feet
Height	16 feet
Control	Ungated
Energy Dissipator	Grouted riprap channel bottom
Downstream channel	Natural stream

j. Outlet Works

Not Applicable



## SECTION 2

### ENGINEERING DATA

#### 2.1 Design

a. Data Available. A summary of engineering data available for Brush Valley Dam is included as Appendix A of this report. Principal documents furnished by DER and used in preparing this report are as follows:

1. Drawing labeled "Plans of Proposed Alterations to the Brush Valley Dam", dated April 12, 1923 (See Appendix E).
2. Hydrological and Hydraulic calculations dated 1915.
3. General correspondence file initiated in 1916.
4. Photographic series initiated in 1921.

b. Design Features. The principal design features for the dam are shown on the drawings reproduced in Appendix E as Plates 2, 3, and 4. The features have been discussed in Section 1.2.a.

#### 2.2 Construction

According to state correspondence, the dam was originally built during the 1880's. Modifications were made in 1920 and 1923. The construction changes made in 1923 were designed by V.H. Lance, Consulting Engineer. There is no evidence to suggest that the construction was not performed in conformance with the modifications as designed.

#### 2.3 Operational Data

The control valve on the 16-inch diversion line is normally positioned to supply the water distribution system. About one million gallons of water is removed daily from storage for the water distribution system. No minimum discharge requirements are imposed by the state.

#### 2.4 Evaluation

a. Availability. All engineering data reproduced in this report and studied for this investigation were provided by DER and supplemented by conversations with Owner's representative.

b. Adequacy. The information made available by DER, conversations with the Owner's representative and observations made during the field investigation provided adequate data for a Phase I evaluation.

c. Validity. There appears to be no reason to question the validity of the limited data available.

## SECTION 3

### VISUAL INSPECTION

#### 3.1 Findings

a. General. The observations and comments of the field inspection team are presented as Appendix B of this report. At the time of the inspection, the water surface was approximately 2-inches above the crest of the spillway. The appearance of the facility indicates that the dam and its appurtenances are well maintained.

b. Dam. (Left and right hand designations are referenced looking downstream.)

The horizontal alignment of the upstream embankment slope shows no apparent indication of settlement or movement. The riprap facing on the slope appears to be well maintained. No evidence of bridging of the riprap or slope failure was evident.

The vertical alignment of the top of the dam varies slightly. A survey profile of the alignment was made by the inspection team and is presented as Plate 5, Appendix E. The top of the dam profile slopes moderately from the downstream side back toward the reservoir.

A number of small holes (about 6-8 inches in diameter and 6-inches deep) in the top of the embankment were noted. The Owner's representative stated that the holes were made by turtles. A few localized depressions about 8-inches deep and 12-inches in diameter were also noted.

The downstream slope has a number of bulges between the spillway and the pumphouse. The downstream portion of the embankment is noticeably non-uniform in slope along this portion of the dam. The bulges may be due to poor construction control or methods; no indications of recent movement or cracks are evident. Some minor sloughing and erosion of the embankment toe was noted to the left of the pumphouse.

Areas of saturated soil and small puddles of water were located along the toe of the embankment between the pumphouse and the spillway below the general area of the embankment bulging. The wet soil condition extends about one third up the length of the slope. No movement could be detected in the puddles of water; the water appeared to be clear. The downstream slope is covered in dense grass that appears to be well maintained. Two small pine seedling were located along the embankment slope. A number of large pine trees, 16-18 inches in diameter, are located about 10 feet downstream of the embankment toe on the right side of the spillway section.

c. Appurtenant Structures. The concrete spillway crest appears to be in good condition. No evidence of misalignment was noted. No accumulation of debris was noted along its entire length.

The abutments forming the sides of the spillway channel appear to be in uniform alignment. The structure has been recently (1975-1976) surfaced with gunite. A few random cracks are evident in this coating. There are no indications of major structural cracking. A shallow depression along the junction of the right abutment wall and the downstream embankment slope was noted. This is probably due to localized erosion or settlement. The Owner's representative stated that during the recent guniting work, the embankment material adjacent to the wall was partially excavated to expose the outside wall area to the treatment.

Drain pipes (about 1-inch in diameter) are located in each of the abutment walls about three feet below the spillway crest. At the time of the inspection, both were discharging clear water.

The downstream slope of the spillway has been coated with gunite. No detrimental conditions were noted on this surface.

A bridge spans the spillway just downstream from the crest. The 14-foot wide wood decked structure is supported by three intermediate steel piers. The piers are braced by members extending from the top of the piers to the downstream slope of the spillway. The decking is constructed of heavy timber and deterioration appears to be minimal. Some minor corrosion at the base of the steel piers supports was noted. A thorough inspection of the bridge was prevented because of the flow conditions at the time of the inspection.

An electrical conduit terminates at the center of the bridge span at a box designated "High Voltage". The conduit extends from the bridge and enters the embankment adjacent to the left side of the left spillway wall. Operating personnel stated that this conduit provided electrical service for the recent repairs made to the spillway.

The channel downstream of spillway is slightly narrower than the spillway width; the overbanks are moderate in slope and heavily wooded.

The intake for the water supply pipe is located about 10 feet upstream of the spillway crest. The structure was submerged at the time of the inspection. A staff gage is located on this structure. The pipe is constructed through the center of the spillway section and emerges from the spillway channel approximately in line with the embankment toe. The control valve is positioned at this location. The valve is protected from low flows by a rock immediately upstream of the valve. In order to operate the valve, operating personnel must enter the spillway channel. According to the Owner's representative, this is the only diversion pipe control.

A valve stem is located on the right side of the left spillway abutment wall. According to operating personnel, this particular control was at one time supplemental to the current control valve, but it is now non-functional.

d. Reservoir. The grounds adjacent to the reservoir are heavily wooded and slope gently to the reservoir. The shoreline adjoining the extreme southern end of the embankment is lined by a low uncemented rock wall (about 3 feet in height



above the normal waterline) for a distance of about 200 feet. Portions (two locations) of this wall have collapsed, but the exposed bank appears to be stable.

Roaring Creek Water Company owns approximately 90 percent of the drainage area; access to the site is controlled.

e. Downstream Channel. The banks of the channel are relatively flat and are wooded. The average channel slope is about 0.4 percent. About 8,000 feet downstream of Brush Valley Dam the channel merges with the reservoir formed by Bear Gap Number 6 Dam. This dam and impoundment are also owned by the Roaring Creek Water Company.

## SECTION 4

### OPERATION PROCEDURES

#### 4.1 Procedures

Normal procedures are limited to the operation of the valve discussed in Section 3.2.c. The valve is normally positioned to direct the pipe flow to the pumphouse.

#### 4.2 Maintenance of the Dam

There is no formal maintenance program for the dam. According to the Owner's representative, maintenance is performed on an "as required" basis by operating personnel. Normal maintenance consists of maintaining the slope cover and protection and removing debris accumulations from the spillway. The embankment and appurtenances are visually inspected daily.

#### 4.3 Maintenance of Operating Facilities

No formal maintenance program is in effect for the operating facilities. According to operating personnel, the screens at the intake structure are cleaned on a frequency of about once a year. The control valve, pipeline and pumphouse equipment are maintained on an "as required" basis. The control valve is exercised between the two operating positions about 3 to 4 times a year.

#### 4.4 Warning System in Effect

No formal warning system or procedures are established for monitoring the structure during periods of heavy rainfall or in the event of impending dam failure. Informally, however, operating personnel are in the area daily and could provide warning. Telephone service is provided to the pumphouse and the operator's residence (located approximately 0.3 miles south of the site). The Owner's consultant, Gannett, Fleming, Corrdry and Carpenter, Inc., has been directed by the Owner to prepare formal warning procedures.

#### 4.5 Evaluation

Periodic inspection of the dam and operating equipment should be made by a qualified engineer. All controls should be operated for his inspection. A review of warning system procedures should be made with operating personnel to insure familiarity.

A formal maintenance program for the dam and appurtenances should be developed and implemented. Records of maintenance performed should be recorded by the Owner.



The single control valve on the diversion pipe located in the center of the spillway discharge channel, is considered inadequate. The valve control wheel would not be accessible under all flow conditions. An additional valve should be located upstream of the existing valve and should be readily accessible to operating personnel during all weather conditions.

## SECTION 5

### HYDRAULICS AND HYDROLOGY

#### 5.1 Evaluation of Features

a. Design Data. Design information relative to the original dam is limited to data submitted with the application made in 1915 and consists of the development of stage-discharge-storage relationships and drainage area computations.

The computed drainage area is about 4.8 square miles. Elevations within the basin vary from a maximum of 1800 to approximately 1120 feet at the reservoir. Typical slopes within the watershed are about 15 percent. The ground is covered by mature forest.

Comparison of the relative storage capacities of Brush Valley Dam and Bear Gap Dam Number 6 indicates that failure of Brush Valley Dam would have a negligible hydraulic impact on Bear Gap Dam Number 6 (located about 3 miles downstream). The maximum storage capacity of Brush Valley Dam is 328 acre-feet compared to a maximum storage capacity of 5,600 acre-feet for Bear Gap Dam Number 6. An instantaneous release of the entire maximum pool storage of Brush Valley Dam would result in an increase of about 1.7 feet in the water surface elevation of the Bear Gap Dam Number 6 (based on the normal pool surface area of 185 acres). Approximately eight feet of freeboard is available at Bear Gap Dam Number 6.

A HEC-I computer analysis was performed for the purpose of flood routing through Brush Valley Dam downstream to Bear Gap Dam Number 6 (the storm was assumed to be centered over the combined watersheds). The results indicated that Bear Gap Dam Number 6 would be overtopped by 37% of the PMF under non-failure conditions for Brush Valley Dam. Assuming failure of Brush Valley Dam, Bear Gap Dam Number 6 would be overtopped by 36% of the PMF. The difference in the water surface elevations at Bear Gap Dam Number 6 under the two conditions (failure and non-failure) is 0.24 feet for fifty percent of the PMF and only 0.08 feet for the full PMF. Therefore, Brush Valley Dam is not considered to significantly affect the hydraulic capabilities of Bear Gap Dam Number 6.

b. Experience Data. Rainfall and spillway discharge records dating from June, 1930 are maintained by the Owner. A staff gauge is located upstream of the spillway and is monitored by operating personnel; a raingage is located about 0.3 miles south of the dam site. According to the Owner's representative, the maximum rainfall and spillway discharge recorded was during Tropical Storm Agness (June 1972). The recorded discharge of 625 cfs corresponds to a reservoir surface elevation of 1125.6 feet which is about 2.6 feet above the spillway crest.

c. Visual Observation. During the inspection, there were no indications that the spillway would not perform as designed. Operating personnel stated that the bridge piers did not create problems by causing debris to collect to a point

where the spillway capacity would be reduced. However, the bridge spanning the spillway may serve to reduce the spillway capacity at higher discharges by limiting flow area.

d. Overtopping Potential. Brush Valley Dam is classified as a "Small" size, "Significant" hazard dam. Accordingly, the Spillway Design Flood (SDF) ranges from 100 year frequency to fifty percent of the PMF. Because of the purpose of the facility and consequences should the dam be breached, fifty percent of the PMF was selected as the appropriate SDF. Fifty percent of the PMF hydrograph was routed through the reservoir with the starting water surface at the spillway crest, Elev. 1123.0. The peak inflow and outflow for fifty percent of the PMF are 4,120 cfs and 4,090 cfs, respectively. The maximum stage in the reservoir for this event is Elev. 1128.7 which is 0.7-foot above the top of the dam. The dam is capable of passing about 25 percent of the PMF before overtopping occurs.

e. Spillway Adequacy. The spillway capacity is classified as "Inadequate" since it is incapable of passing fifty percent of the PMF.



## SECTION 6

### STRUCTURAL STABILITY

#### 6.1 Evaluation of Structural Stability

a. Visual Observation. The overall structural appearance of the dam at the time of the inspection was fair. The localized bulging of the downstream slope and associated moisture conditions may be the result of poor construction control or methods. A subsurface investigation would be necessary to determine the cause and severity of these conditions.

The erosion and sloughing of the embankment near the pumphouse and linear depression in the embankment adjacent to the right abutment wall do not appear to be detrimental to the structural integrity of the dam. However, these conditions should be repaired or stabilized through the normal maintenance program and observations should periodically be made to detect any future developments at these locations.

Because of the recent surfacing treatment applied to the spillway structure, the physical appearance of the masonry walls could not be observed. However, no misalignment or settlement, which might indicate structural movement, was noted.

b. Design and Construction Data. Design and construction data relative to the original dam is unavailable. A review of the correspondence however, indicates that the spillway was constructed as a timber rockfill with an upstream clay slope. The spillway abutments were reported to be of masonry construction, about 5 feet in width.

An inspection of the drawings submitted with the application to modify the dam in 1915, indicates that the embankment is a homogeneous structure with no seepage control facilities. The available drawings and data contain no information as to the permeability and strength characteristics of the embankment and foundation materials. Also, no calculations were made available relative to structural or slope stability.

c. Operating Records. Spillway discharge and quantities of water diverted to the water system are recorded by the Owner. The period of record is from June 1930 to the present. Rainfall records are also maintained.

d. Post-Construction Changes. The spillway rockfill was grouted and the crest length was increased to its present dimensions in 1920. A concrete cut-off was also constructed in the spillway rockfill and the rockfill was grouted. Cut-offs were extended from the spillway walls into both embankments for a distance of thirty feet.

In 1923, the embankment and spillway crest were raised two feet and one-foot, respectively.

e. Seismic Stability. Brush Valley Dam is located in Seismic Zone 1 as shown on the Seismic Zone Map of Contiguous States. A dam located in Seismic Zone 1 is considered to be structurally adequate for Zone 1 earthquake loading if it is structurally adequate for static loadings.



## SECTION 7

### ASSESSMENT, RECOMMENDATIONS AND PROPOSED REMEDIAL MEASURES

#### 7.1 Dam Assessment

a. Evaluation. Based on visual observations, the dam and appurtenances appear to be in fair condition.

The bulging and general non-uniformity of the downstream embankment slope, most apparent between the spillway and pumphouse, may be a result of poor construction control or methods.

The cause of ponded water at embankment toe and the wet soil condition extending up the slope from the toe could not be determined during the inspection.

From visual observations the spillway appears to be in good condition. The structural integrity of the spillway could not be determined during the visual inspection due to the recent surfacing treatment.

The operational control of the diversion pipe is considered to be inadequate. The control valve would not be accessible under all flow conditions.

b. Adequacy. The information made available by DER, conversations with the Owner's representative and observations made during the field investigation provided adequate data for a Phase I evaluation.

c. Urgency. The remedial measures recommended in Section 7.2 should be effected as soon as possible.

d. Necessity for further Investigation. Further investigation should be implemented as discussed in Section 7.2.a.

#### 7.2 Recommendations and Remedial Measures

##### a. Embankment and Facilities

1. Further hydrologic and hydraulic studies should be made to determine the extent to which the spillway capacity should be increased.
2. A subsurface investigation program should be initiated to determine the composition and in-situ properties of the earth embankment and foundation materials and to determine the stability of the dam. Piezometers should be placed to monitor the phreatic surface. The investigations should be supervised by a licensed professional engineer experienced in the design and construction of dams.

3. Provisions for placing an additional positive control valve on the 16-inch diversion pipe upstream of the embankment should be made. The valve operating mechanism should be fully accessible for all flow conditions.
4. A ditch should be constructed to drain water away from the toe of the embankment.

b. Operation and Maintenance

1. The Owner should develop and implement a formal maintenance and inspection program to insure that all items are maintained on a regular basis. Maintenance activities performed should be recorded to provide a history of corrected deficiencies.
2. A downstream warning system should be developed by the Owner. During periods of heavy rainfall, the dam should be monitored and appropriate agencies should be alerted in the event of an impending failure.

APPENDIX

A

Check List Engineering Data  
Design, Construction, Operation  
Phase I



CHECK LIST  
ENGINEERING DATA  
DESIGN, CONSTRUCTION, OPERATION  
PHASE I

NAME OF DAM Brush Valley Dam  
ID # PA00652

Sheet 1 of 4

ITEM AS-BUILT DRAWINGS

REMARKS No "as built" drawings are available.

REGIONAL VICINITY MAP

Refer to Appendix E .

CONSTRUCTION HISTORY

Construction history is limited to a correspondence file initiated by the State in 1915.

TYPICAL SECTIONS OF DAM

Typical sections are shown on proposed construction drawings for dam modifications that were apparently not made. Refer to Appendix E.

OUTLETS - PLAN

Refer to Appendix E for drawings.

DETAILS

CONSTRAINTS

DISCHARGE RATINGS - Provided by DER (apparently for the original spillway shape).

RAINFALL/RESERVOIR RECORDS - Rainfall/reservoir records are maintain by the owner .  
The maximum reservoir surface elevation was recorded during Tropical Storm Agnes, June 1979.

ITEM	REMARKS
DESIGN REPORTS	Reports are limited to data provided with the initial dam application submitted in 1915.
GEOLOGY REPORTS	No data available.
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	No data available . Limited to data provided with the initial dam application. No data available . No data available .
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY } FIELD }	No data available.
POST-CONSTRUCTION SURVEYS OF DAM	No data available.
BORROW SOURCES	No data available.

ITEM	REMARKS
MONITORING SYSTEMS	Reservoir stage and rainfall records are maintained by the owner. The period of record is from June 1930.
MODIFICATIONS	See section 1.2g.
HIGH POOL RECORDS	Maximum reservoir pool recorded occurred in June 1972, Tropical Storm Agnes. (water surface elevation <u>+125.6</u> ft).
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	None available.
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	None available.
MAINTENANCE OPERATION RECORDS	Records of major repairs to the dam were documented in the correspondence file provided by DER.



ITEM	REMARKS
<div> <div>SPILLWAY PLAN</div> <div> <div>SECTIONS</div> <div>DETAILS</div> </div> </div>	<div>Refer to Appendix E.</div>
<div>OPERATING EQUIPMENT PLANS &amp; DETAILS</div>	<div>Refer to Appendix E.</div>
<div>MISCELLANEOUS</div>	

APPENDIX

B

Check List

Visual Inspection

Phase I

CHECK LIST  
VISUAL INSPECTION  
PHASE I

Sheet 1 of 11

Name Dam Brush Valley Dam County Columbia State Pennsylvania National ID # PA00652  
Type of Dam Earth Embankment Hazard Category Significant  
Date(s) Inspection 4/10/79 Weather Clear Temperature 50° F.

Pool Elevation at Time of Inspection + 1123.2 M.S.L. Tailwater at Time of Inspection + 1108 M.S.L.

Inspection Personnel:

L. H. DeHeer  
R. F. Horvath  
R. R. Bowers  
R. E. Horvath Recorder

Remarks:

The inspection team was accompanied by Mr. H. Sacona, Engineer, Roaring Creek Water Company  
and Mr. W.B. Bingham, Project Engineer, Gannett, Fleming, Corddry and Carpenter, Inc.



# CONCRETE/MASONRY DAMS

Sheet 2 of 11

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
ANY NOTICEABLE SEEPAGE	N/A	
STRUCTURE TO ABUTMENT/EMBANKMENT JUNCTIONS	N/A	
DRAINS	N/A	
WATER PASSAGES	N/A	
FOUNDATION	N/A	

# CONCRETE/MASONRY DAMS

Sheet 3 of 11

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS CONCRETE SURFACES	N/A	
STRUCTURAL CRACKING	N/A	
VERTICAL AND HORIZONTAL ALIGNMENT	N/A	
MONOLITH JOINTS	N/A	
CONSTRUCTION JOINTS	N/A	

EMBANKMENT

Sheet 4 of 11

<u>VISUAL EXAMINATION OF</u>	<u>OBSERVATIONS</u>	<u>REMARKS OR RECOMMENDATIONS</u>
SURFACE CRACKS	None observed.	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None observed.	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	Sloughing of the embankment toe was evident in an area between the pumphouse and south abutment (The affected area is limited in size to about ten square feet).	The embankment should be repaired and inspected periodically to detect and prevent further adverse conditions from developing.
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	Bulges were evident on the downstream slope between the pumphouse and spillway.  No significant deviations in the vertical or horizontal alignment of the crest were noted. (Refer to Appendix E for the crest profile).	Further investigation should be initiated to determine the cause and severity of the bulges.
RIPRAP FAILURES	None observed.	



EMBANKMENT

Sheet 5 of 11

<u>VISUAL EXAMINATION OF</u>	<u>OBSERVATIONS</u>	<u>REMARKS OR RECOMMENDATIONS</u>
------------------------------	---------------------	-----------------------------------

JUNCTION OF EMBANKMENT  
AND ABUTMENT, SPILLWAY  
AND DAM

A linear depression about 4 to 6 inches deep was noted at the junction of the north spillway wall and embankment (downstream slope).

The depression may be a result of the removal and replacement of the embankment material during the most recent repair work performed on the spillway. The depression area should be inspected periodically to detect any developing detrimental condition.

ANY NOTICEABLE SEEPAGE

Areas of ponded water were located at the toe of the embankment between the pump-house and spillway. No movement in the water could be detected. The lower third of the embankment slope in this area also appeared to be in a moist condition.

Further investigation should be initiated to determine the cause and severity of the moisture condition.

STAFF GAGE AND RECORDER A staff gage is positioned on the intake structure about 15 feet upstream of the spillway crest. Readings are recorded daily by operating personnel.

DRAINS

Drain pipes are constructed in both downstream spillway walls. At the time of the inspection both pipes were discharging clear flow (3-4 gpm). The drains should be inspected periodically to detect any significant changes in quality or quantity of flow.

OUTLET WORKS

Sheet 6 of 11

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	The diversion pipe is constructed through the spillway section and is not exposed for visual inspection	
INTAKE STRUCTURE	Not observed, submerged under normal conditions.	
OUTLET STRUCTURE	Only the control valve is visible. No significant deficiencies were noted. The owner's representative stated that the valve control is in working condition.	
OUTLET CHANNEL	The outlet channel is merged with the spillway channel.	
EMERGENCY GATE	N/A	

UNGATED SPILLWAY

Sheet 7 of 11

<u>VISUAL EXAMINATION OF</u>	<u>OBSERVATIONS</u>	<u>REMARKS OR RECOMMENDATIONS</u>
CONCRETE WEIR	The entire spillway has recently been surfaced with gunite. Some minor cracking in the treatment was noted. A thorough inspection of the spillway could not be performed due to the flow condition at the time of the inspection.	
APPROACH CHANNEL	N/A	
DISCHARGE CHANNEL	The discharge channel has been recently gunited. No significant cracking or settlement was noted.	
BRIDGE AND PIERS	A bridge supported by two piers spans the spillway. Minor corrosion at the base of the piers was noted. The bridge decking is constructed with heavy timbers. No significant deterioration was noted.	The steel supports should be protected from corrosion through a periodic coating application.



GATED SPILLWAY

Sheet 8 of 11

REMARKS OR RECOMMENDATIONS

OBSERVATIONS

VISUAL EXAMINATION OF

CONCRETE SILL

N/A

APPROACH CHANNEL

N/A

DISCHARGE CHANNEL

N/A

BRIDGE AND PIERS

N/A

GATES AND OPERATION  
EQUIPMENT

N/A

INSTRUMENTATION

Sheet 9 of 11

<u>VISUAL EXAMINATION</u>	<u>OBSERVATIONS</u>	<u>REMARKS OR RECOMMENDATIONS</u>
---------------------------	---------------------	-----------------------------------

MONUMENTATION/SURVEYS

N/A

OBSERVATION WELLS

N/A

WEIRS

N/A

PIEZOMETERS

N/A

OTHER

A raingage is located approximately 0.3 miles south of the dam. Readings are made by operating personnel, and recorded and maintained by the owner.

RESERVOIR

Sheet 10 of 11

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
-----------------------	--------------	----------------------------

SLOPES

The slopes adjacent to the reservoir are moderate and heavily wooded. A rock retaining wall (about 4 feet high) constructed for a length of approximately 400 feet along the south shore has partially failed. The exposed earth however appears to be stable.

SEDIMENTATION

The drainage area is well covered with vegetation and the general maintenance of the site is good. It is reasonable to assume that sedimentation process occurs at a low rate.



DOWNSTREAM CHANNEL

Sheet 11 of 11

REMARKS OR RECOMMENDATIONS

OBSERVATIONS

VISUAL EXAMINATION OF

CONDITION  
(OBSTRUCTIONS,  
DEBRIS, ETC.)

No obstructions were noted during the field inspection.

SLOPES

The overbanks of the downstream channel are relatively flat and well vegetated.

APPROXIMATE NO.  
OF HOMES AND  
POPULATION

No permanent residences are constructed between Brush Valley Dam and the next downstream dam (approx. 3 miles). A summer residence has been constructed adjacent to the abutment of the downstream dam.

APPENDIX

C

Hydrologic & Hydraulic Data

TABLE OF CONTENTS - APPENDIX C

HYDROLOGIC AND HYDRAULIC DATA

HYDROLOGY CALCULATIONS

SHEET 1

HEC-1 - DAM SAFETY VERSION, COMPUTER INPUT  
AND OUTPUT

SHEETS 2-9



SUBJECT	SHEET	BY	DATE	JOB NO.
BRUSH VALLEY DAM	1	RRE		

### HYDROLOGY CALCS.

DRAINAGE AREA (PLANIMETERED FROM USGS QUAD SHEET): 4.8 SQ. MI.

### PMP CALCULATIONS (HM REPORT 40)

AREA IS IN ZONE 1

$$24 \text{ HR.}, 200 \text{ SQ. MI. RAINFALL} = (22") (1.01) = 22.2"$$

<u>HR.</u>	<u>%</u>	<u>RAINFALL</u>	<u>DRF</u>
6	118	26.2"	26.2"
12	127	28.2"	2.0"
24	136	30.2"	2.0"
48	142	31.5"	1.3"

### SNYDER COEFFICIENTS

FROM INFO. PROVIDED BY COE, FOR THE  
SUSQUEHANNA RIVER BASIN, ZONE 13:

$$C_p = 0.50$$

AND  $C_t = 1.85$

$$t_p = C_t (L \cdot L_{ca})^{0.3}$$

$$L = 3.6 \text{ MILES}$$

$$L_{ca} = 1.7 \text{ MILES}$$

$$t_p = C_t (3.6 \cdot 1.7)^{0.3} = 3.19 \text{ HRS.}$$



PREVIEW OF SEQUENCE OF STEIN NETWORK CALCULATIONS

MUNIFF HYDROGRAPH AT INFLOW  
ROUTE HYDROGRAPH TO OUTFLO  
END OF NETWORK



\*\*\*\*\*  
 FLOOD HYDROGRAPH PLOT-AGE (PREC-1)  
 DAM SAFETY VERSION JULY 1976  
 LAST MODIFICATION 25 SEP 76  
 \*\*\*\*\*

201 WATER 8-22/79  
 TIME 15.53H.

NATIONAL DAM INSPECTION PROGRAM  
 BRUSH VALLEY DAM  
 PRE HYDROGRAPH

NO	WMP	WMIN	10GV	14P	1MIN	WTRC	1PRT	INSTAN
300	0	30	0	0	0	0	0	0
			JDEP	NWT	L-OUT	TPACE		
			5	0	0	0		

MULTI-PLAN ANALYSES TO BE PERFORMED  
 NPLAN= 1 NATIO= 4 LPTIO= 1

RTIOS=	.20	.30	.40	.50	.60	.70	.80	.90	1.00
--------	-----	-----	-----	-----	-----	-----	-----	-----	------

\*\*\*\*\* SUB-AREA RUNOFF COMPUTATION \*\*\*\*\*

RUNOFF TO BRUSH VALLEY RESERVOIR

ISTAG	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
INFLOW	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

ITHYD	IU-G	TAREA	SNAP	TP-DA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	4.80	0.00	4.80	0.00	0.000	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	L24	R48	R72	R96
0.00	22.20	118.00	127.00	136.00	142.00	0.00	0.00

TRSPC COMPUTED BY THE PROGRAM IS .800

LOSS DATA

LROPT	STMR	DLTK	RTIO	ENAIN	STPKS	RTIOF	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	1.00	.05	0.00	0.00

UNIT HYDROGRAPH DATA

TP= 3.19 CPE .50 NAT= 0

RECESSION DATA

STRTO= -1.50 UNCSN= -.05 RTIOF= 2.00

UNIT HYDROGRAPH 50 END-OF-PERIOD ORDINATES, LARG= 3.21 HOURS, CPE= .50 VOL= 1.00	
26.	365.
325.	115.
102.	36.
32.	11.
10.	4.

00000000

## ROUTING THROUGH HPU- VALLEY RESERVOIR

PEAK OUTFLOW IS	1477. AT TIME	44.00 HOURS
PEAK OUTFLOW IS	2441. AT TIME	43.50 HOURS
PEAK OUTFLOW IS	3265. AT TIME	43.00 HOURS
PEAK OUTFLOW IS	4090. AT TIME	43.00 HOURS
PEAK OUTFLOW IS	4912. AT TIME	43.00 HOURS
PEAK OUTFLOW IS	5735. AT TIME	43.00 HOURS
PEAK OUTFLOW IS	6557. AT TIME	43.00 HOURS
PEAK OUTFLOW IS	7379. AT TIME	43.00 HOURS

5

.....

.....

.....

.....

.....

SEC. 400.14 3.11.17.1021 31.000.000.000



PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS  
 FLOWS IN CUBIC FEET PER SECOND (CUMIC METERS PER SECOND)  
 AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS								
				RATIO 1	RATIO 2	RATIO 3	RATIO 4	RATIO 5	RATIO 6	RATIO 7	RATIO 8	RATIO 9
				.20	.30	.40	.50	.60	.70	.80	.90	1.00
HYDROGRAPH AT	INFLW	4.80 ( 12.43)	1	1549.	2474.	3299.	4123.	4946.	5773.	6598.	7422.	8247.
			(	45.71)(	70.06)(	93.41)(	116.76)(	140.12)(	163.47)(	186.82)(	210.18)(	233.53)
ROUTED TO	OUTFLW	4.80 ( 12.43)	1	1477.	2441.	3265.	4090.	4912.	5735.	6557.	7379.	8201.
			(	41.43)(	69.13)(	92.45)(	115.40)(	139.10)(	162.39)(	185.67)(	208.95)(	232.23)

# STIMULY OF AM SAFETY ANALYSIS

PLAY ] .....

ELEVATION  
STORAGE  
OUTFLOW

INITIAL VALUE  
1123.00  
126.  
0.

SPILLWAY CREST  
1123.00  
126.  
0.

TOP OF DAM  
1128.00  
328.  
1802.

DATE  
PAGE

MAXIMUM  
RESERVOIR  
N. S. ELEV

MAXIMUM  
CYCLE  
OVER DAW

MAXIMUM  
STORAGE  
AC-FY

MAXIMUM  
OUTFLOW  
CFS

**DURATION  
OVER TOP  
HOURS**

TIME OF  
OUTFLOW  
HOURS

TIME OF  
FAILURE  
HOURS

.20  
 .30  
 .40  
 .50  
 .60  
 .70  
 .80  
 .90  
 1.00

1127.38  
1128.30  
1128.55  
1128.75  
1128.96  
1129.10  
1129.20  
1129.41  
1129.55

0.00  
0.30  
0.55  
0.75  
0.94  
1.10  
1.26  
1.41  
1.55

293.  
347.  
362.  
376.  
386.  
400.  
411.  
421.  
432.

1477.  
2441.  
3265.  
4090.  
4912.  
5735.  
6557.  
7379.  
8201.

0.00  
3.00  
5.50  
7.00  
8.50  
9.50  
10.00  
11.00  
11.50

44.00  
43.50  
43.00  
43.00  
43.00  
43.00  
43.00  
43.00

BRUSH VALLEY DAM	SHEET 9	BY	DATE	JOB NO.
------------------	------------	----	------	---------

THE CONIC METHOD WAS USED TO DETERMINE  
THE STAGE STORAGE RELATIONSHIP BELOW NORMAL  
POOL

$$\Delta Vol = \frac{h}{3} (A_1 + A_2 + \sqrt{A_1 A_2})$$

Given  $\Delta Vol = 126 \text{ AcFt}$

$A_2 = 24 \text{ Ac}$

Assume  $A_1 = 0$

Solve for h

$$126 = \frac{h}{3} (24)$$

$$15.75 = h$$

Elevation at 0 surface area. =  $1123 - 15.75 = 1107.25$

use 1107.3



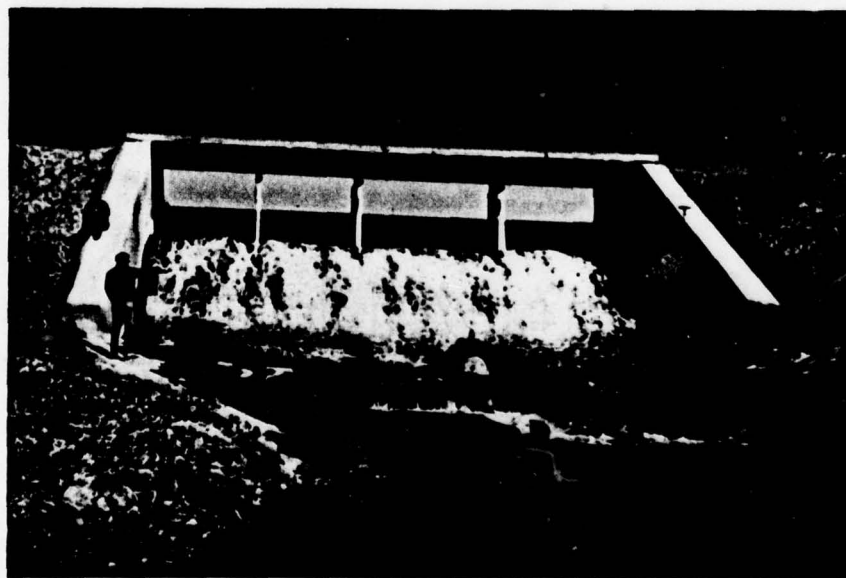
APPENDIX

D

Photographs



*EMBANKMENT AND PUMPHOUSE  
LOOKING SOUTH FROM THE RIGHT ABUTMENT*



*DOWNSTREAM VIEW OF THE SPILLWAY WITH  
THE DIVERSION PIPE CONTROL VALVE IN THE FOREGROUND*

D-1

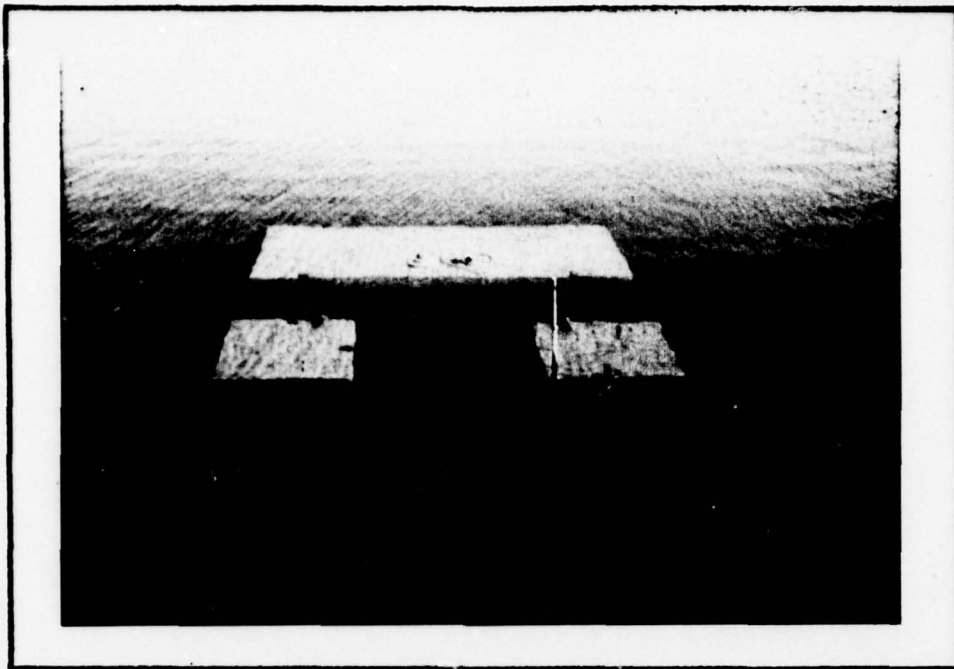


*RIPRAP PROTECTION ON THE UPSTREAM  
SLOPE OF THE DAM*



*SPILLWAY AND ACCESS BRIDGE*

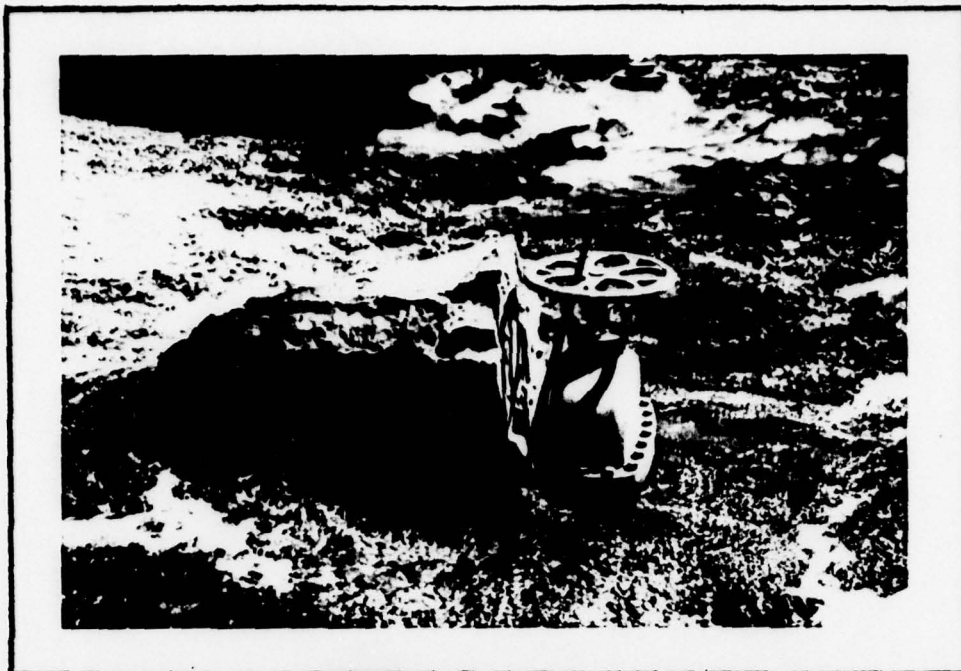




*SUBMERGED INTAKE STRUCTURE  
AND STAFF GAUGE*



*DOWNSTREAM SLOPE OF THE EMBANKMENT*



*DIVERSION PIPE CONTROL VALVE IN THE OUTLET CHANNEL  
IMMEDIATELY DOWNSTREAM OF THE SPILLWAY*



*DOWNSTREAM CHANNEL AS VIEWED FROM  
THE BRIDGE OVER THE SPILLWAY*

APPENDIX

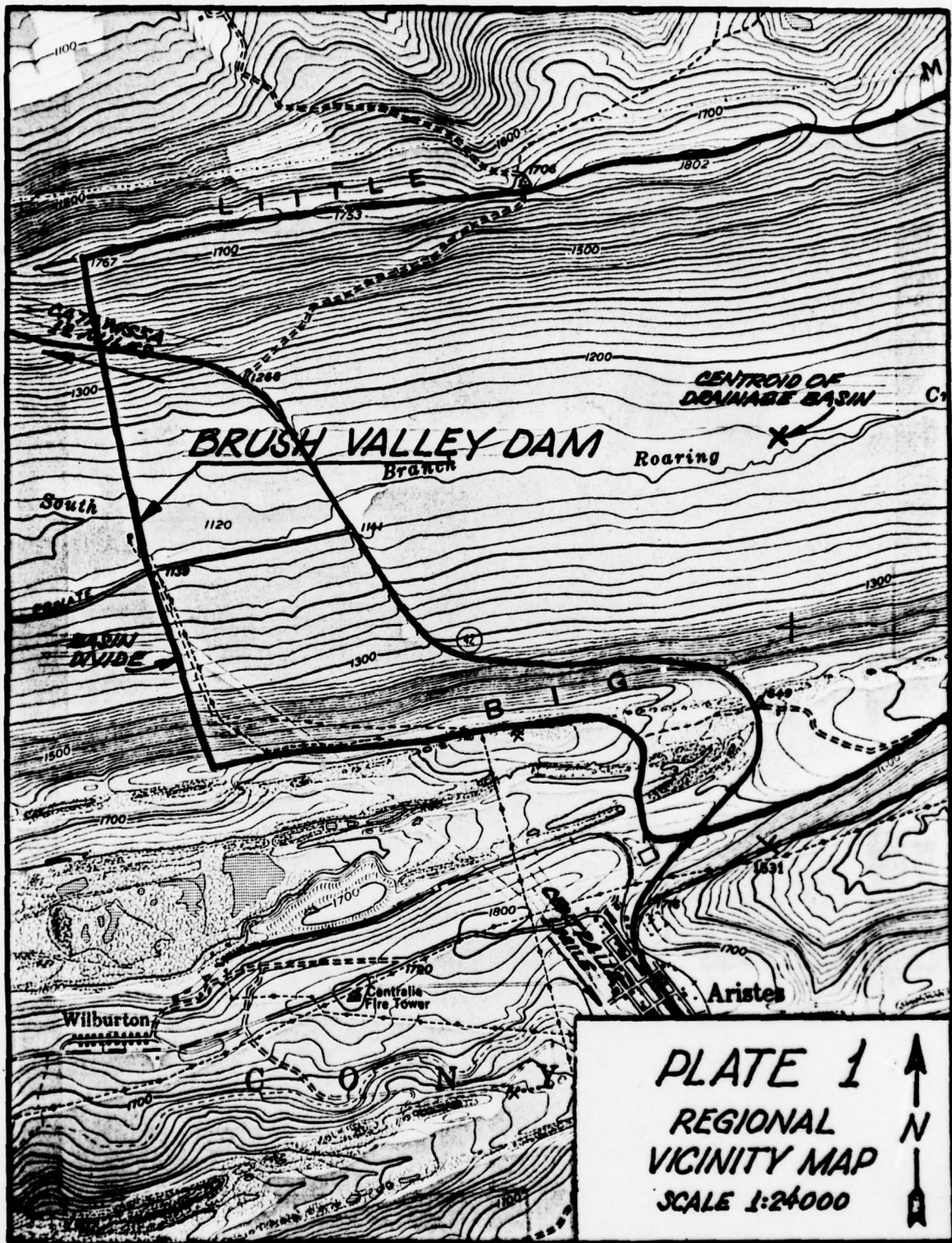
E

Drawings

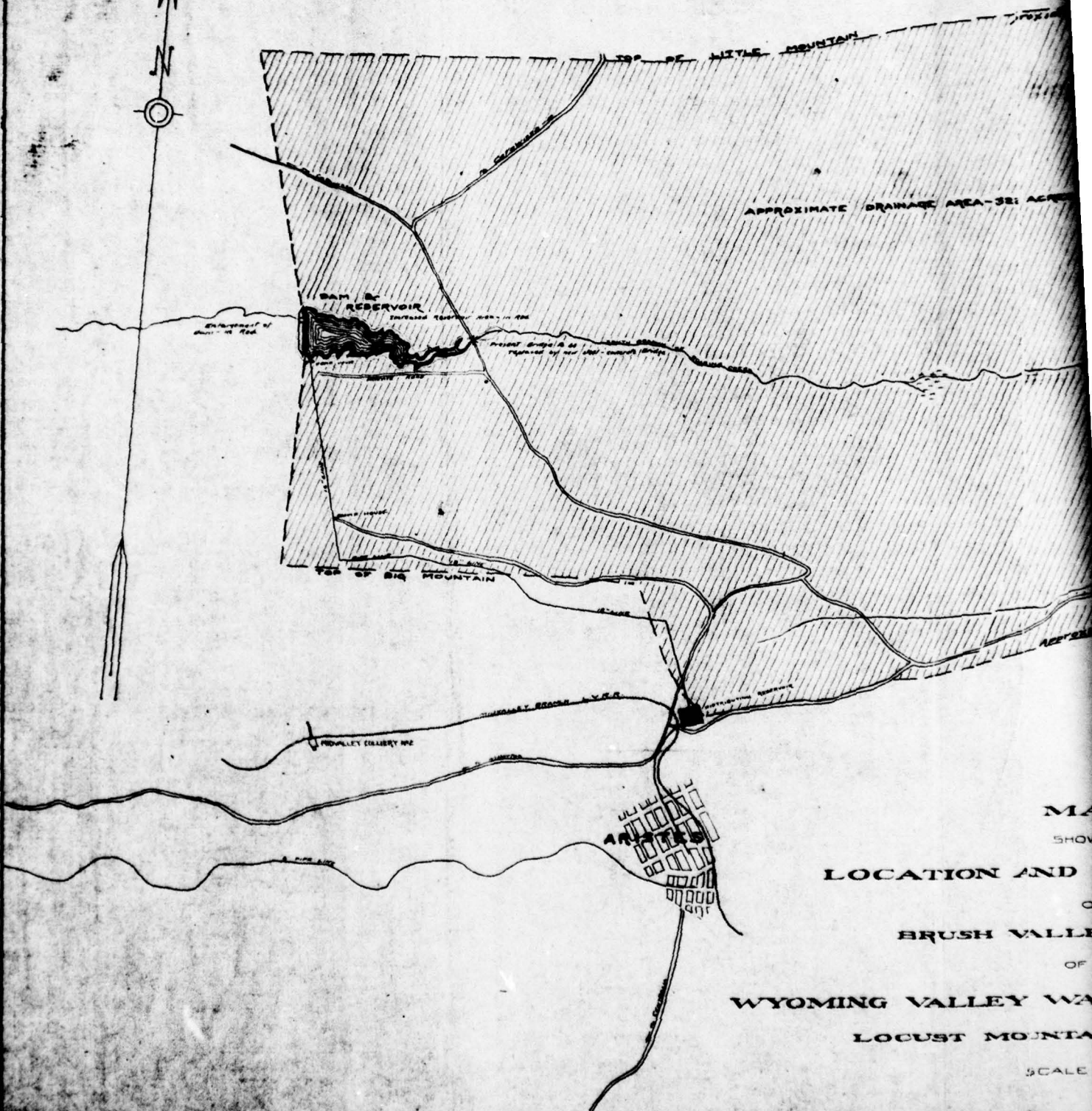


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REGIONAL VICINITY MAP	PLATE 1
LOCATION AND DRAINAGE AREA	PLATE 2
CROSS SECTIONS	PLATE 3
PROPOSED ALTERATIONS	PLATE 4
PLAN VIEW OF DAM WITH PROBLEMS NOTED	PLATE 5
PROFILE OF TOP OF DAM	PLATE 6



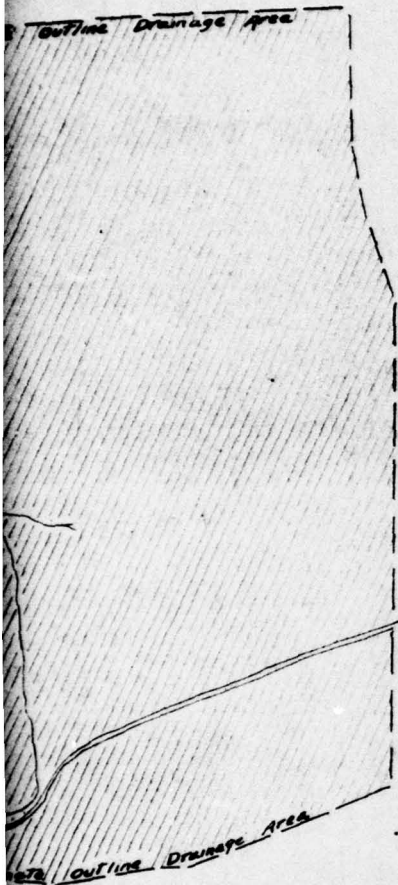




MA  
SHOW  
LOCATION AND  
OF  
BRUSH VALLEY  
OF  
WYOMING VALLEY WA  
LOCUST MOUNTAIN

SCALE

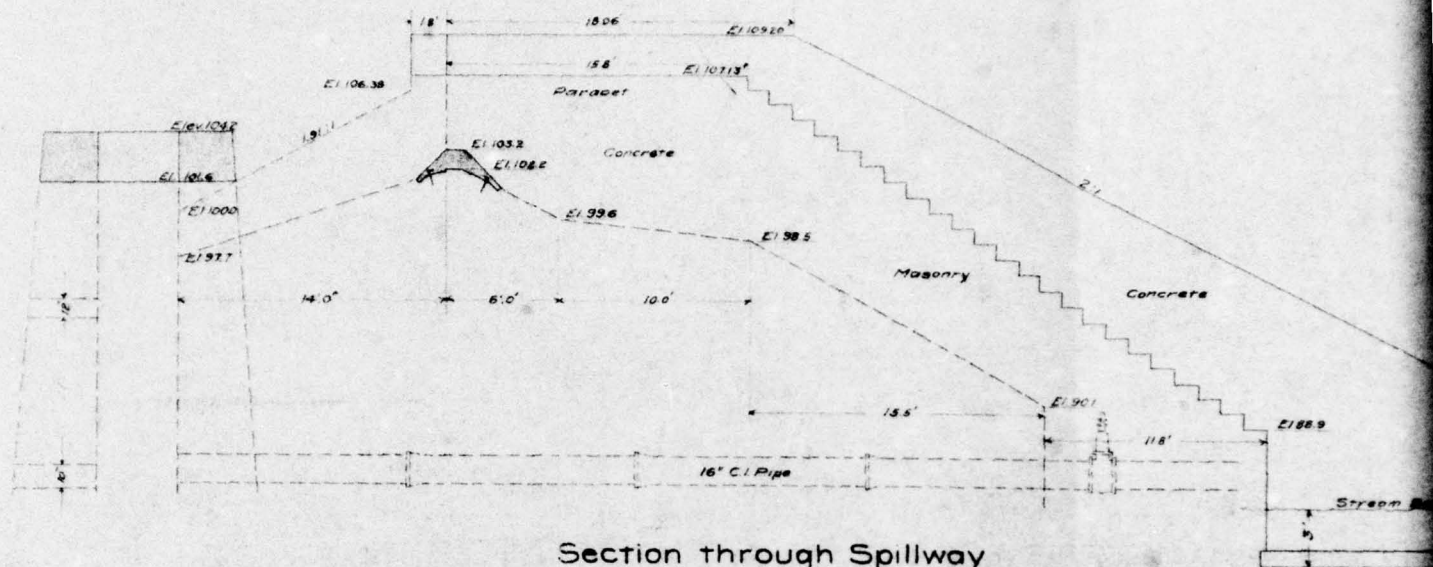




P  
NG  
RAINAGE AREA  
Y RESERVOIR  
VE  
ER SUPPLY COMPANY  
N DEPARTMENT  
-800Ft  
PLATE 2

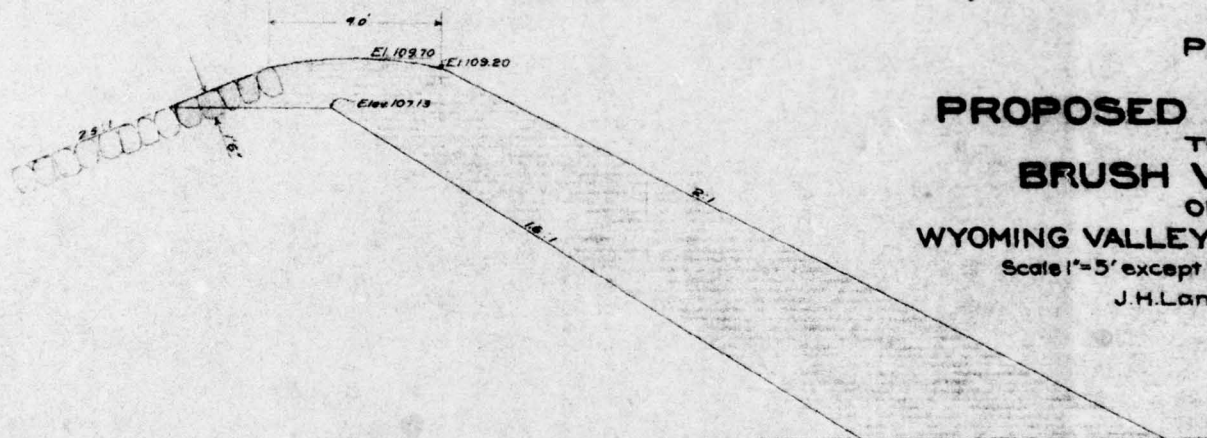
APPROVED

2

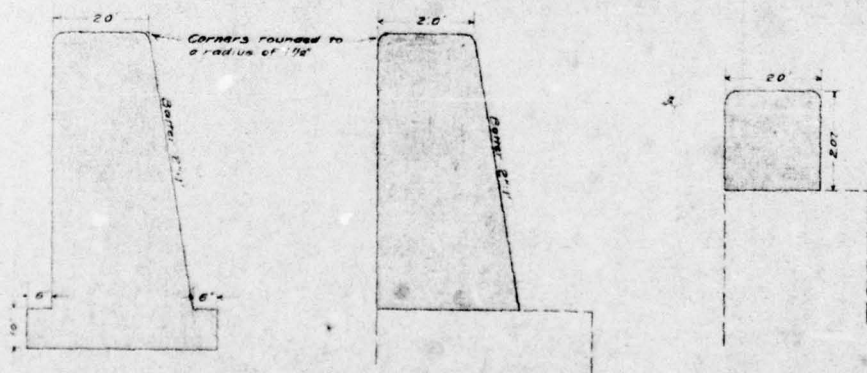


Section through Spillway

**PLANS  
OF  
PROPOSED ALTERATION  
TO THE  
BRUSH VALLEY DAM  
OF THE  
WYOMING VALLEY WATER SUPPLY**  
Scale 1"=5' except as noted. April 12, 1912  
J.H. Lance, Cons. Eng.



Typical Section through Embankment Addition



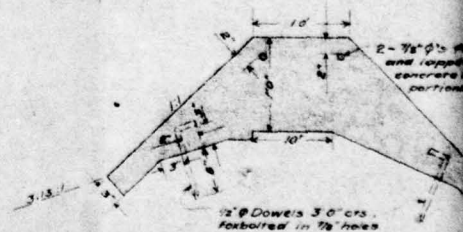
On Earth Foundation

On Existing Retaining Wall

On Existing Parapet

Typical Sections through Retaining Wall Addition

Scale 1"=2'



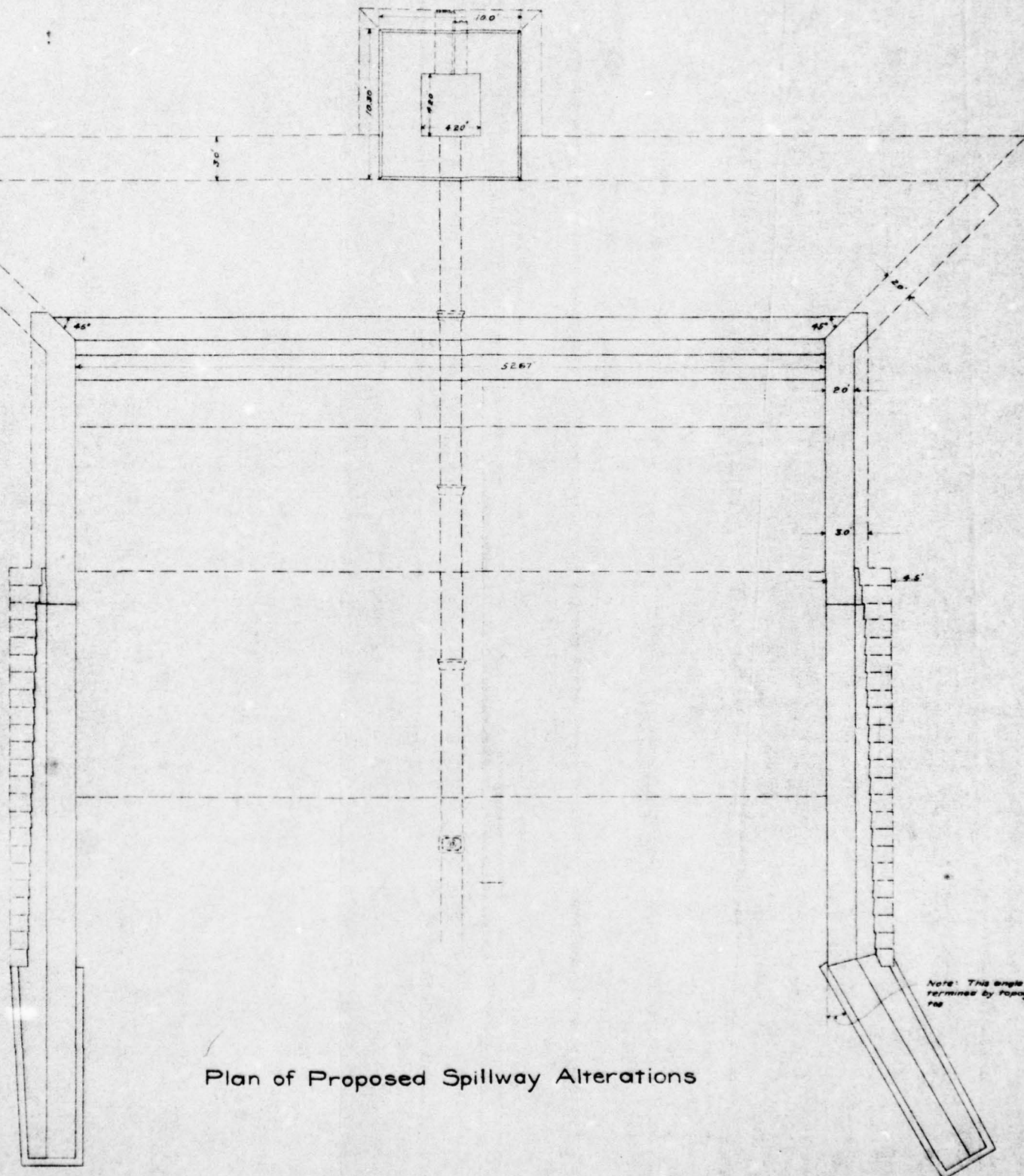
Sectional Detail of Spillway  
Scale 1"=1'



ONS  
1  
LY CO.  
23

lapped at ends  
3'6" with 1" =  
hidden lapped

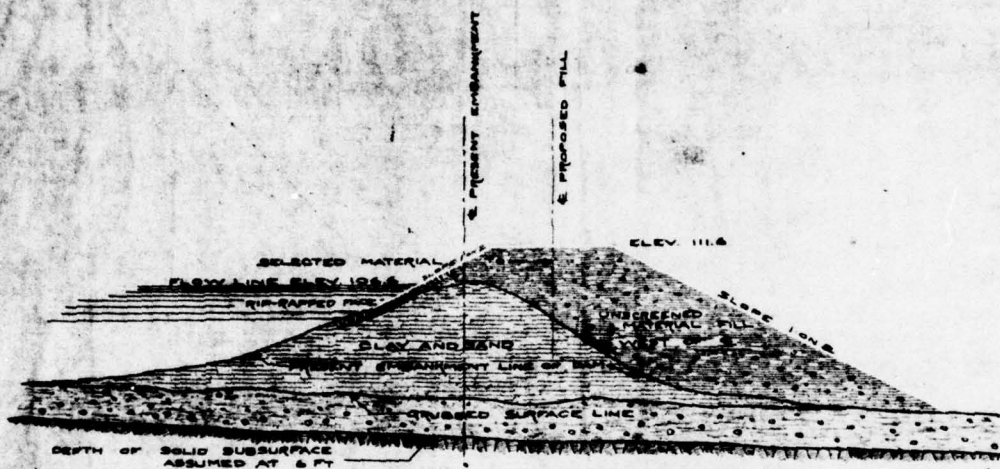
Addition



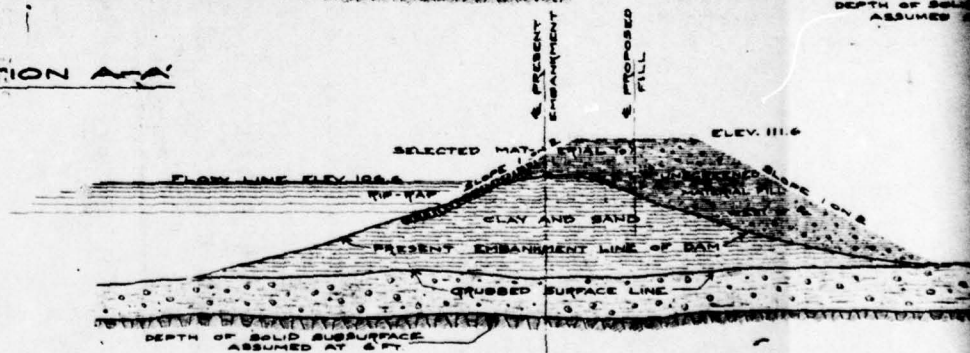
Plan of Proposed Spillway Alterations

PLATE 3

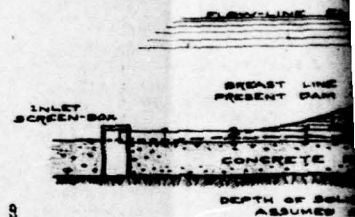


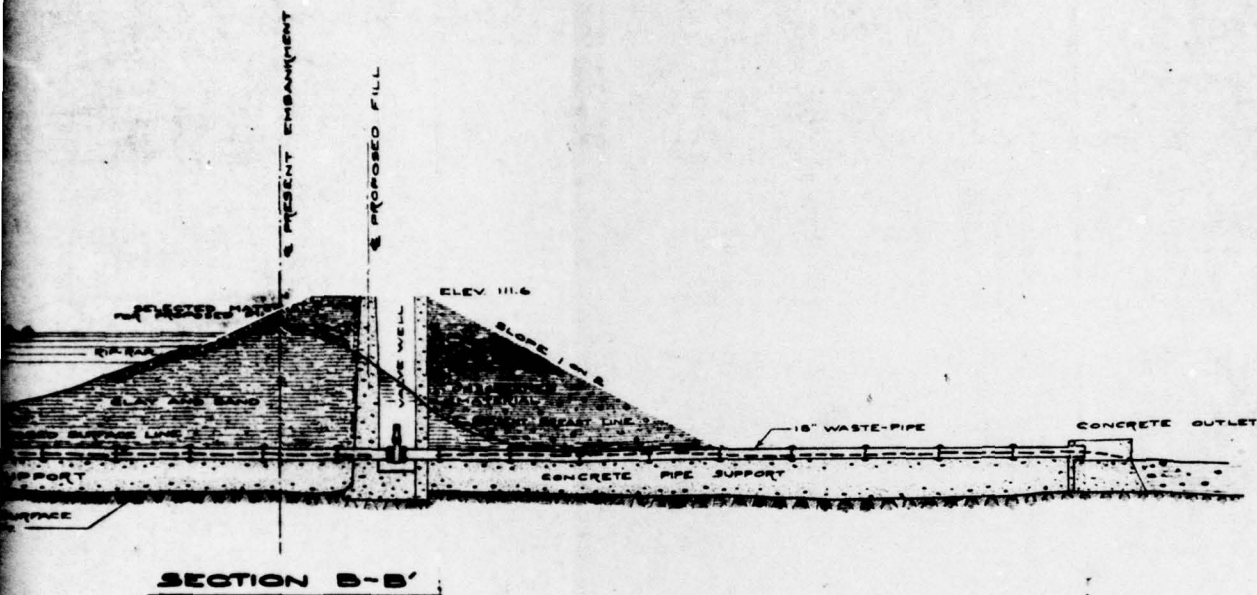


**SECTION A-A'**



**SECTION C-C'**





**CROSS SECTIONS**  
 SHOWING  
**RECONSTRUCTION OF DAM**  
 AT  
**BRUSH VALLEY RESERVOIR**  
 OF THE  
**WYOMING VALLEY WATER SUPPLY COMPANY**  
**LOCUST MOUNTAIN DEPARTMENT**  
 SCALE 1"=10'

PLATE 4

APPROVED: \_\_\_\_\_

2

SUBJECT

BRUSH VALLEY DAM

SHEET

5

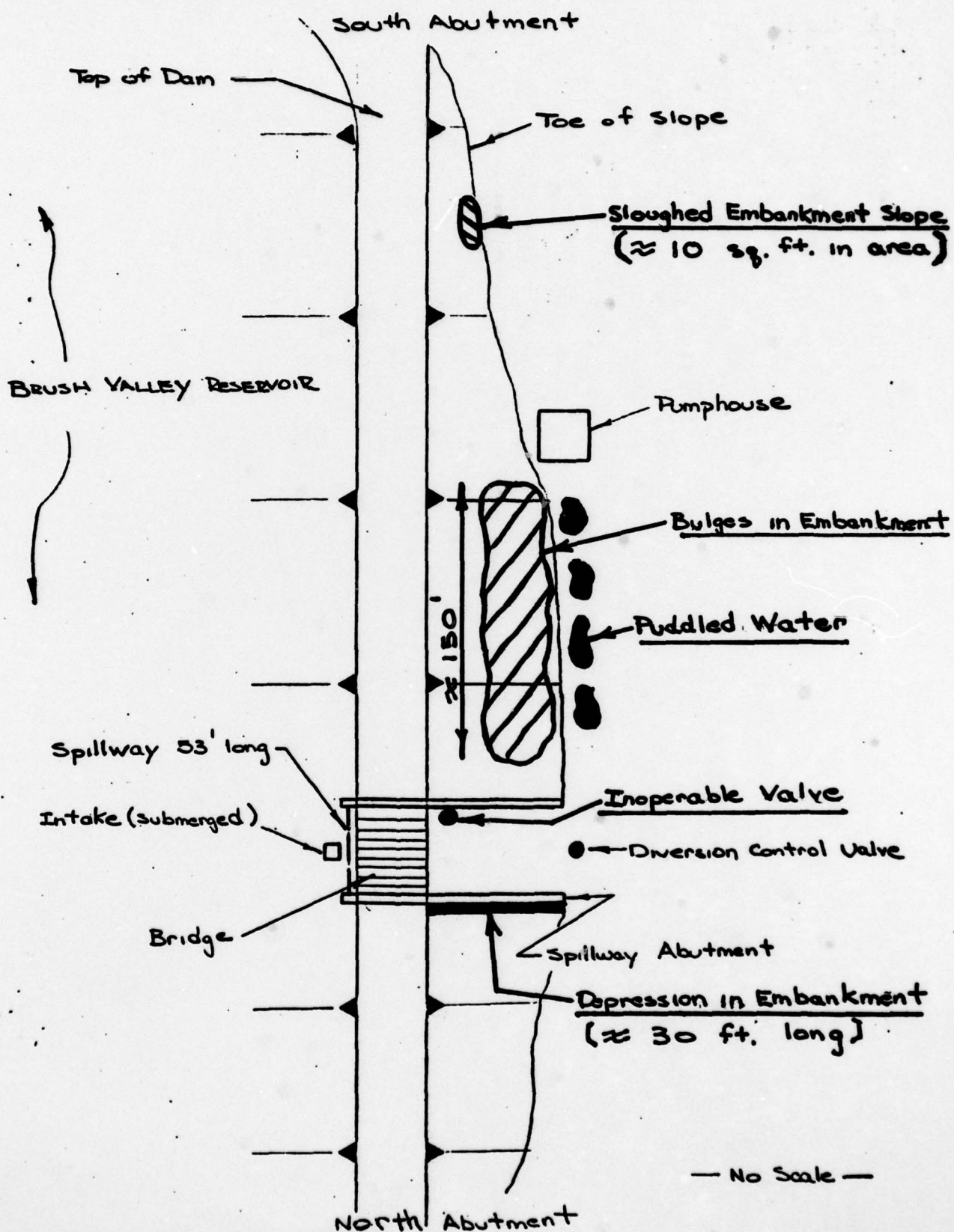
BY

RSH

DATE

JOB NO

1041 00 116





SUBJECT

BRUSH VALLEY DAM - VERT ALIGNMENT

SHEET

BY

REH

DATE

JOB NO

1841 010

NORTH ABUTMENT

1128.2

1127.9

1128.0

1127.9

1127.8

1127.9

1128.1

1127.9

1127.9

1128.1

1128.2

1128.1

1128.0

1128.0

1128.0

SOUTH ABUTMENT

Spillway Crest -  
1123.0 (datum)

SCALE :

- 1" = 100' HORIZ

- ELEVATIONS AS MARKED

PLATE 6

APPENDIX

F

Site Geology

## SITE GEOLOGY

### BRUSH VALLEY DAM

Brush Valley Dam is located in the Appalachian Mountains section of the Valley and Ridge physiographic province. The embankment was constructed on unconsolidated alluvium which is underlain by the Mississippian Mauch Chunk formation. The red shale and sandstone sedimentary beds typifying this formation have been warped so that the dam rests on the north flank of a synclinal fold. No faults or major structural defects are noted in the vicinity of the dam or lake.



